**COURSE DETAILS**

**Course Code:** B38RO  
**Full Course Title:** Introduction to Robotics  
**SCQF Level:** 8  
**SCAF Credits:** 15  
**Available as Elective:** No

**DELIVERY LEVEL**

- Undergraduate: Yes  
- Postgraduate Taught: No  
- Postgraduate Research: No

Additional Information:  
<p>Course being delivered at the specified campus(es) and also by Collaborative Partner - Ocean University of China on BEng Robotics Programme.</p>

**COURSE AIMS**

Understand fundamental concepts of robot kinematics.

Understand concepts of links, joints, end-effector, and environment for robotic systems.

Gain proficiency in applying reference frames and transformations in robotic systems.

Understand forward and inverse kinematics and gain proficiency in computing these in robotic systems.

Understand fundamental concepts of robot dynamics.

Understand the concepts of force, torque, and inertia matrix relations for robotic systems.

Gain proficiency in applying Newton Equations for translational and rotational movements in robotic systems.

Apply the knowledge of robot kinematics and dynamics to a simple robot manipulator system.

Gain exposure to the concepts of trajectory planning, robot control, force/torque sensing, and robot vision in the context of robot kinematics and dynamics.

**LEARNING OUTCOMES – SUBJECT MASTERY**

**EA2i** Ability to apply the reference frames, transformation matrices, translation and rotation relations to robotic systems using the Denavit-Hartenberg convention.
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**LEARNING OUTCOMES – PERSONAL ABILITIES**

- Develop skills to apply kinematics and dynamics analysis techniques to robotic systems.
- Develop skills to simulate the kinematics and dynamics relations of robotic systems.

**SYLLABUS**

1) Robot Arm Kinematics (5 weeks=15 hours lecture, 5 hours tutorial)
    i) Reference frames
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ii) Rotations and transformations
iii) DH Convention and Parameters
iv) Forward Kinematics
v) Inverse Kinematics

2) Robot Arm Dynamics (5 weeks=15 hours lecture, 5 hours tutorial)
i) Newton Equations applied to translations and rotations
ii) Inertia matrix computation
iv) Newton-Euler Formulation of Robot Dynamics
v) Lagrange-Euler Formulation of Robot Dynamics

3) Complementary Topics in Brief (1 week=3 hours lecture, 1 hour tutorial)
i) Trajectory Planning
ii) Control of Manipulators (computed Torque Control)
iii) Force/Torque and Touch Sensors
iv) Robot Vision

COURSE RELATIONSHIPS
N/A

LOCATION AND ASSESSMENT METHODS

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